



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/749,578

12/30/2003

Kwan-Ju Koh

20067/OPP031477US

8991

34431

7590

06/03/2005

HANLEY, FLIGHT & ZIMMERMAN, LLC  
20 N. WACKER DRIVE  
SUITE 4220  
CHICAGO, IL 60606

EXAMINER

BOOTH, RICHARD A

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 06/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

24

<b>Office Action Summary</b>	Application No. 10/749,578	Applicant(s) KOH, KWAN-JU	
	Examiner Richard A. Booth	Art Unit 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some    c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwak et al., U.S. Patent 5,940,730 in view of Yoshiki et al., U.S. Patent 5,843,236.

Kwak et al. shows the invention substantially as claimed including a method for forming a contact hole or a via hole in a semiconductor device comprising: rounding a top edge of a contact hole or a via hole by using a plasma when an interlayer insulation film is selectively etched to form the contact hole or the via hole (see figs. 1a-1c and col. 2-line 14 to col. 3-line 12).

Kwak does not expressly disclose that the plasma has a spiral movement.

Yoshiki et al. discloses a plasma etching process whereby the plasma has a spiral movement (see col. 3-lines 10-21). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kwak et al. so as to use a plasma with a spiral movement because in such a way the plasma density can be enhanced.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kwak et al., U.S. Patent 5,940,730 in view of Yoshiki et al., U.S. Patent 5,843,236 as applied to claims 1-2 above, and further in view of Mihara et al., U.S. Patent 5,681,780.

Kwak et al. and Yoshiki et al. are applied as above but do not expressly disclose etching using a gas of fluorine series.

Mihara et al. discloses etching a contact hole using fluorocarbon gas (see col. 1-lines 20-25). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to etch the contact hole in the process of Kwak et al. modified by Yoshiki et al. using fluorocarbon gas since this is shown to be a suitable method in which to etch a contact hole.

Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwak et al., U.S. Patent 5,940,730 in view of Yoshiki et al., U.S. Patent 5,843,236 as applied to claims 1-2 above, and further in view of Lee et al., U.S. Patent 5,998,870.

Kwak et al. and Yoshiki et al. are applied as above but do not expressly disclose forming a barrier metal film on the inner wall of the contact hole and filling the contact hole with a metal material.

Lee et al. discloses forming a barrier metal film 37 on the inner wall of the contact hole and filling the contact hole with a metal material 43b (see figs. 7a-7c and their description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kwak et al.

modified by Yoshiki et al. so as to form the metal structure in the contact hole because such a configuration allows for the formation of a buried contact.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwak et al., U.S. Patent 5,940,730 in view of Yoshiki et al., U.S. Patent 5,843,236 and further in view of Mihara et al., U.S. Patent 5,681,780 as applied to claim 3above, and further in view of Lee et al., U.S. Patent 5,998,870.

Kwak et al., Yoshiki et al., and Mihara et al. are applied as above but do not expressly disclose forming a barrier metal film on the inner wall of the contact hole and filling the contact hole with a metal material.


Lee et al. discloses forming a barrier metal film 37 on the inner wall of the contact hole and filling the contact hole with a metal material 43b (see figs. 7a-7c and their description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kwak et al. modified by Yoshiki et al. and Mihara et al. so as to form the metal structure in the contact hole because such a configuration allows for the formation of a buried contact.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is (571) 272-1668. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Richard A. Booth  
Primary Examiner  
Art Unit 2812

May 31, 2005